

absorbed through the skin.

**Ingestion:** Not expected to be harmful if swallowed.

**Inhalation:** The vapor or fumes from this material may cause respiratory irritation. Symptoms of respiratory irritation may include coughing and difficulty breathing.

#### **DELAYED OR OTHER HEALTH EFFECTS:**

**Cancer:** Prolonged or repeated exposure to this material can cause cancer.

**Target Organs:** Contains material that may cause damage to the following organ(s) following repeated skin contact: Liver Blood/Blood Forming Organs

See Section 11 for additional information. Risk depends on duration and level of exposure.

#### **SECTION 4: FIRST AID MEASURES**

**Eye:** No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.

**Skin:** No specific first aid measures are required. As a precaution, remove clothing and shoes if contaminated. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

**Ingestion:** No specific first aid measures are required. Do not induce vomiting. As a precaution, get medical advice.

**Inhalation:** Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if breathing difficulties continue.

#### **SECTION 5: FIRE FIGHTING MEASURES**

See Section 7 for proper handling and storage.

#### **FIRE CLASSIFICATION:**

OSHA Classification (29 CFR 1910.1200): Combustible liquid.

**NFPA RATINGS:** Health: 1 Flammability: 2 Reactivity: 0

#### **FLAMMABLE PROPERTIES:**

**Flashpoint:** > 66 °C (> 150 °F)

**Autoignition:** 371 °C (700 °F)

**Flammability (Explosive) Limits (% by volume in air):** Lower: Not Applicable Upper: Not Applicable

**EXTINGUISHING MEDIA:** Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

#### **PROTECTION OF FIRE FIGHTERS:**

**Fire Fighting Instructions:** For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

**Combustion Products:** Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

#### **SECTION 6: ACCIDENTAL RELEASE MEASURES**

**Protective Measures:** Eliminate all sources of ignition in the vicinity of the spill or released vapor. If this material is released into the work area, evacuate the area immediately. Monitor area with combustible gas indicator.

**Spill Management:** Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. All equipment used when handling the product must be grounded. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.

**Reporting:** Report spills to local authorities and/or the U.S. Coast Guard's National Response Center at (800) 424-8802 as appropriate or required.

## SECTION 7. HANDLING AND STORAGE

**Precautionary Measures:** Liquid evaporates and forms vapor (fumes) which can catch fire and burn with explosive force. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches. Fire hazard is greater as liquid temperature rises above 29C (85F).

Do not get in eyes, on skin, or on clothing. Do not breathe vapor or fumes. Wash thoroughly after handling.

**General Handling Information:** Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.

**Static Hazard:** Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

**General Storage Information:** DO NOT USE OR STORE near heat, sparks, flames, or hot surfaces. USE AND STORE ONLY IN WELL VENTILATED AREA. Keep container closed when not in use.

**Container Warnings:** Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconitioner or disposed of properly.

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

### ENGINEERING CONTROLS:

If user operations generate airborne material, use process enclosures, local exhaust ventilation, or other engineering controls to control exposure.

## PERSONAL PROTECTIVE EQUIPMENT

**Eye/Face Protection:** No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

**Skin Protection:** Wear protective clothing to prevent skin contact. Selection of protective clothing may include gloves, apron, boots, and complete facial protection depending on operations conducted.

Suggested materials for protective gloves include: Nitrile Rubber, Silver Shield, The thin laminates (Silver Shield, 4H) should be worn as an under-glove., Viton.

**Respiratory Protection:** If exposure to harmful levels of airborne material may occur when working with this material, wear an approved respirator that provides protection, such as: Air-Purifying Respirator for Organic Vapors.

Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

No applicable occupational exposure limits exist for this material or its components.

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

**Color:** Brown

**Physical State:** Liquid

**Odor:** Petroleum odor

**pH:** Not Applicable

**Vapor Pressure:** <1 mmHg

**Vapor Density (Air = 1):** Not Applicable

**Boiling Point:** 204°C (399.2°F) - 427°C (800.6°F)

**Solubility:** Soluble in hydrocarbon solvents; insoluble in water.

**Melting Point:** Not Applicable

**Specific Gravity:** 0.97 - 0.99 @ 15.6°C (60.1°F) / 15.6°C (60.1°F)

**Viscosity:** >20.5 mm<sup>2</sup>/s @ 37.8°C (100°F)

## SECTION 10: STABILITY AND REACTIVITY

**Chemical Stability:** This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

**Incompatibility With Other Materials:** May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

**Hazardous Decomposition Products:** None known (None expected)

**Hazardous Polymerization:** Hazardous polymerization will not occur.

## SECTION 11: TOXICOLOGICAL INFORMATION

### IMMEDIATE HEALTH EFFECTS

**Eye Irritation:** The eye irritation hazard is based on evaluation of data for similar materials or product components.

**Skin Irritation:** The skin irritation hazard is based on evaluation of data for similar materials or product components.

**Skin Sensitization:** The skin sensitization hazard is based on evaluation of data for similar materials or product components.

**Acute Dermal Toxicity:** The acute dermal toxicity hazard is based on evaluation of data for similar materials or product components.

**Acute Oral Toxicity:** The acute oral toxicity hazard is based on evaluation of data for similar materials or product components.

**Acute Inhalation Toxicity:** The acute inhalation toxicity hazard is based on evaluation of data for

similar materials or product components.

#### ADDITIONAL TOXICOLOGY INFORMATION:

This product may contain significant amounts of Polynuclear Aromatic Hydrocarbons (PAH's) which have been shown to cause skin cancer after prolonged and frequent contact with the skin of test animals. Brief or intermittent skin contact with this product is not expected to have serious effects if it is washed from the skin. While skin cancer is unlikely to occur in human beings following use of this product, skin contact and breathing, of mists, vapors or dusts should be reduced to a minimum.

#### SECTION 12: ECOLOGICAL INFORMATION

##### ECOTOXICITY

This material is expected to be harmful to aquatic organisms and may cause long-term adverse effects in the aquatic environment. The ecotoxicity hazard is based on an evaluation of data for the components or a similar material.

##### ENVIRONMENTAL FATE

This material is not expected to be readily biodegradable. The biodegradability of this material is based on data for a similar material.

#### SECTION 13: DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

#### SECTION 14: TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

**DOT Shipping Description:** PETROLEUM RESIDUAL FUEL OIL; NOT REGULATED AS A HAZARDOUS MATERIAL FOR TRANSPORTATION UNDER 49 CFR

**IMO/IMDG Shipping Description:** NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORTATION UNDER THE IMDG CODE

#### SECTION 15: REGULATORY INFORMATION

##### EPCRA 311/312 CATEGORIES:

1. Immediate (Acute) Health Effects:	NO	
2. Delayed (Chronic) Health Effects:	YES	
3. Fire Hazard:		YES
4. Sudden Release of Pressure Hazard:	NO	
5. Reactivity Hazard:		NO

##### REGULATORY LISTS SEARCHED:

01-1=IARC Group 1

03=EPCRA 313

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01-2A=IARC Group 2A  
01-2B=IARC Group 2B  
02=NTP Carcinogen

04=CA Proposition 65  
05=MA RTK  
06=NJ RTK  
07=PA RTK

The following components of this material are found on the regulatory lists indicated.  
Distillates (petroleum), heavy catalytic cracked 01-1

#### CHEMICAL INVENTORIES:

All components comply with the following chemical inventory requirements: AICS (Australia), DSL (Canada); EINECS (European Union), IECSC (China), KECI (Korea), TSCA (United States).

#### WHMIS CLASSIFICATION:

Class B, Division 3: Combustible Liquids  
Class D, Division 2, Subdivision A: Very Toxic Material -  
Carcinogenicity

#### SECTION 16: OTHER INFORMATION

NFPA RATINGS: Health: 1 Flammability: 2 Reactivity: 0

(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, \*- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

**REVISION STATEMENT:** This revision updates the following sections of this Material Safety Data Sheet: 3,4,7,14,15  
**Revision Date:** January 10, 2007

#### ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	PEL - Permissible Exposure Limit
	CAS - Chemical Abstract Service Number
ACGIH - American Conference of Government Industrial Hygienists	IMO/IMDG - International Maritime Dangerous Goods Code
API - American Petroleum Institute	MSDS - Material Safety Data Sheet
CVX - Chevron	NFPA - National Fire Protection Association (USA)
DOT - Department of Transportation (USA)	NTP - National Toxicology Program (USA)
IARC - International Agency for Research on Cancer	OSHA - Occupational Safety and Health Administration

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the Chevron Energy Technology Company, 100 Chevron Way, Richmond, California 94802.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our

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control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

6. Process Safety Information (PSI) and Process Safety Hazards (PHA) for FCC "fractionator bottom system" cleaning and "turnaround".

**Attachment 6C - MSDS for Light Cat Cracked Distillate**



# Material Safety Data Sheet

## SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

### Cat Cracked Distillate, Light

**Product Use:** Refinery stream  
**Product Number(s):** CPS243911, CPS286310  
**Synonyms:** F/O - Cutter Stock, FCC Light Cycle Oil, Gas Oil, Cracked  
**Company Identification**  
Chevron Products Company  
Marketing, MSDS Coordinator  
6001 Bollinger Canyon Road  
San Ramon, CA 94583  
United States of America

#### Transportation Emergency Response

CHEMTREC: (800) 424-9300 or (800) 424-9300 or (703) 527-3887

#### Health Emergency

Chevron/Texaco Emergency Information Center: Located in the USA. International collect calls accepted.  
(800) 231-0623 or (510) 231-0623

#### Product Information

MSDS Requests: (800) 689-3998

## SECTION 2: COMPOSITION INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
Distillates (petroleum), light catalytic cracked	64741-59-9	100 %wt/wt

## SECTION 3: HAZARDS IDENTIFICATION

### EMERGENCY OVERVIEW

- COMBUSTIBLE LIQUID AND VAPOR
- MAY CAUSE LUNG DAMAGE IF SWALLOWED
- MAY CAUSE RESPIRATORY TRACT IRRITATION IF INHALED
- CAUSES SKIN IRRITATION
- MAY CAUSE CANCER BASED ON ANIMAL DATA

### IMMEDIATE HEALTH EFFECTS

**Eye:** Not expected to cause prolonged or significant eye irritation.

**Skin:** Contact with the skin causes irritation. Contact with the skin is not expected to cause an allergic skin response. Symptoms may include pain, itching, discoloration, swelling, and blistering. Not expected to be harmful to internal organs if absorbed through the skin.

**Ingestion:** Because of its low viscosity, this material can directly enter the lungs, if swallowed, or if subsequently vomited. Once in the lungs it is very difficult to remove and can cause severe injury or death. May be irritating to mouth, throat, and stomach. Symptoms may include pain, nausea, vomiting.

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and diarrhea.

**Inhalation:** The vapor or fumes from this material may cause respiratory irritation. Symptoms of respiratory irritation may include coughing and difficulty breathing. Excessive or prolonged breathing of this material may cause central nervous system effects. Central nervous system effects may include headache, dizziness, nausea, vomiting, weakness, loss of coordination, blurred vision, drowsiness, confusion, or disorientation. At extreme exposures, central nervous system effects may include respiratory depression, tremors or convulsions, loss of consciousness, coma or death.

#### **DELAYED OR OTHER HEALTH EFFECTS:**

**Cancer:** Prolonged or repeated exposure to this material may cause cancer.

See Section 11 for additional information. Risk depends on duration and level of exposure.

### **SECTION 4: FIRST AID MEASURES**

**Eye:** No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.

**Skin:** Wash skin with water immediately and remove contaminated clothing and shoes. Get medical attention if any symptoms develop. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

**Ingestion:** If swallowed, get immediate medical attention. Do not induce vomiting. Never give anything by mouth to an unconscious person. If swallowed, get medical attention. Do not induce vomiting. Never give anything by mouth to an unconscious person.

**Inhalation:** Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if breathing difficulties continue.

**Note to Physicians:** Ingestion of this product or subsequent vomiting may result in aspiration of light hydrocarbon liquid, which may cause pneumonitis.

### **SECTION 5: FIRE FIGHTING MEASURES**

See Section 7 for proper handling and storage.

#### **FIRE CLASSIFICATION:**

OSHA Classification (29 CFR 1910.1200): Combustible liquid.

**NFPA RATINGS:** Health: 1 Flammability: 2 Reactivity: 0

#### **FLAMMABLE PROPERTIES:**

**Flashpoint:** (Pensky-Martens Closed Cup) 54 °C - 66 °C (130 °F - 150 °F)

**Autoignition:** 371 °C (700 °F)

**Flammability (Explosive) Limits (% by volume in air):** Lower: 1 Upper: 6

**EXTINGUISHING MEDIA:** Use water fog, foam, dry chemical or carbon dioxide (CO<sub>2</sub>) to extinguish flames.

#### **PROTECTION OF FIRE FIGHTERS:**

**Fire Fighting Instructions:** For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

**Combustion Products:** Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

### **SECTION 6: ACCIDENTAL RELEASE MEASURES**

**Protective Measures:** Eliminate all sources of ignition in the vicinity of the spill or released vapor. If this

material is released into the work area, evacuate the area immediately. Monitor area with combustible gas indicator.

**Spill Management:** Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. All equipment used when handling the product must be grounded. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.

**Reporting:** Report spills to local authorities and/or the U.S. Coast Guard's National Response Center at (800) 424-8802 as appropriate or required.

## SECTION 7: HANDLING AND STORAGE

**Precautionary Measures:** Liquid evaporates and forms vapor (fumes) which can catch fire and burn with explosive force. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches. Fire hazard is greater as liquid temperature rises above 29C (85F).

Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Do not breathe vapor or fumes. Wash thoroughly after handling.

**Static Hazard:** Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

**General Storage Information:** DO NOT USE OR STORE near heat, sparks, flames, or hot surfaces. USE AND STORE ONLY IN WELL VENTILATED AREA. Keep container closed when not in use.

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

### GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

### ENGINEERING CONTROLS:

If user operations generate airborne material, use process enclosures, local exhaust ventilation, or other engineering controls to control exposure.

### PERSONAL PROTECTIVE EQUIPMENT

**Eye/Face Protection:** No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

**Skin Protection:** Wear protective clothing to prevent skin contact. Selection of protective clothing may include gloves, apron, boots, and complete facial protection depending on operations conducted.

Suggested materials for protective gloves include: 4H (PE/EVAL), Polyvinyl Alcohol (PVA) (Note: Avoid

contact with water. PVA deteriorates in water.), Silver Shield, The thin laminates (Silver Shield, 4H) should be worn as an under-glove., Viton.

**Respiratory Protection:** If exposure to harmful levels of airborne material may occur when working with this material, wear an approved respirator that provides protection, such as: Air-Purifying Respirator for Organic Vapors.

Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

No applicable occupational exposure limits exist for this material or its components.

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

**Color:** Amber

**Physical State:** Liquid

**Odor:** Hydrocarbon odor

**pH:** Not Applicable

**Vapor Pressure:** <1 mmHg @ 25 °C (77 °F)

**Vapor Density (Air = 1):** Not Applicable

**Boiling Point:** 148.9°C (300°F) - 371.1°C (700°F)

**Solubility:** Soluble in hydrocarbon solvents; insoluble in water.

**Freezing Point:** Not Applicable

**Melting Point:** Not Applicable

**Specific Gravity:** 0.93 - 0.96 @ 15.6°C (60.1°F) (Min)

**Viscosity:** 2.5 cSt @ 40°C (104°F)

## SECTION 10: STABILITY AND REACTIVITY

**Chemical Stability:** This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

**Incompatibility With Other Materials:** May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

**Hazardous Decomposition Products:** None known (None expected)

**Hazardous Polymerization:** Hazardous polymerization will not occur.

## SECTION 11: TOXICOLOGICAL INFORMATION

### IMMEDIATE HEALTH EFFECTS

**Eye Irritation:** The Draize eye irritation mean score in rabbits for a 24-hour exposure was: 3.2/110.

**Skin Irritation:** For a 24-hour exposure, the Primary Irritation Score (PIS) in rabbits is: 6.9/8.0.

**Skin Sensitization:** This material did not cause skin sensitization reactions in a Buehler guinea pig test.

**Acute Dermal Toxicity:** LD50: 2g/kg (rabbit).

**Acute Oral Toxicity:** LD50: >5 g/kg (rat)

**Acute Inhalation Toxicity:** 4 hour(s) LC50: 4.65mg/l (rat).

### ADDITIONAL TOXICOLOGY INFORMATION:

Cat Cracked Distillate, Light was found to be a skin carcinogen after twice a week application to C3H mice over their lifetime. This material was also determined to be a skin tumor promoter with weak initiating activity in CD-1 mice.

This product may contain significant amounts of Polynuclear Aromatic Hydrocarbons (PAH's) which have been shown to cause skin cancer after prolonged and frequent contact with the skin of test animals. Brief or intermittent skin contact with this product is not expected to have serious effects if it is washed from the skin. While skin cancer is unlikely to occur in human beings following use of this product, skin

contact and breathing, of mists, vapors or dusts should be reduced to a minimum.

## SECTION 12: ECOLOGICAL INFORMATION

### ECOTOXICITY

The toxicity of this material to aquatic organisms has not been evaluated. Consequently, this material should be kept out of sewage and drainage systems and all bodies of water.

### ENVIRONMENTAL FATE

No data available.

## SECTION 13: DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

## SECTION 14: TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

**DOT Shipping Description:** PETROLEUM DISTILLATES, N.O.S., Combustible Liquid, UN1268, III  
**Additional Information:** WHEN FLASH IS >200F THIS IS NOT A HAZARDOUS MATERIAL. USE SHIPPING NAME - PETROLEUM DISTILLATE FUEL OIL.

**IMO/IMDG Shipping Description:** PETROLEUM DISTILLATES, N.O.S., 3, UN1268, III, FLASH POINT SEE SECTION 5

## SECTION 15: REGULATORY INFORMATION

### EPCRA 311/312 CATEGORIES:

1. Immediate (Acute) Health Effects:	YES
2. Delayed (Chronic) Health Effects:	YES
3. Fire Hazard:	YES
4. Sudden Release of Pressure Hazard:	NO
5. Reactivity Hazard:	NO

### REGULATORY LISTS SEARCHED:

01-1=IARC Group 1	03=EPCRA 313
01-2A=IARC Group 2A	04=CA Proposition 65
01-2B=IARC Group 2B	05=MA RTK
02=NTP Carcinogen	06=NJ RTK
	07=PA RTK

No components of this material were found on the regulatory lists above.

### CHEMICAL INVENTORIES:

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EP/

All components comply with the following chemical inventory requirements: AICS (Australia), DSL (Canada), EINECS (European Union), IECSC (China), KECI (Korea), PICCS (Philippines), TSCA (United States).

**WHMIS CLASSIFICATION:**

Class B, Division 3: Combustible Liquids

Class D, Division 2, Subdivision A: Very Toxic Material -  
Carcinogenicity

Class D, Division 2, Subdivision B: Toxic Material -  
Skin or Eye Irritation

**SECTION 6: OTHER INFORMATION**

**NFPA RATINGS:** Health: 1 Flammability: 2 Reactivity: 0

(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, \*- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

**REVISION STATEMENT:** This revision updates the following sections of this Material Safety Data Sheet: 1,14

**Revision Date:** 02/15/2006

**ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:**

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	PEL - Permissible Exposure Limit
	CAS - Chemical Abstract Service Number
ACGIH - American Conference of Government Industrial Hygienists	IMO/IMDG - International Maritime Dangerous Goods Code
API - American Petroleum Institute	MSDS - Material Safety Data Sheet
CVX - ChevronTexaco	NFPA - National Fire Protection Association (USA)
DOT - Department of Transportation (USA)	NTP - National Toxicology Program (USA)
IARC - International Agency for Research on Cancer	OSHA - Occupational Safety and Health Administration

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the ChevronTexaco Energy Research & Technology Company, 100 Chevron Way, Richmond, California 94802.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

6. Process Safety Information (PSI) and Process Safety Hazards (PHA) for FCC "fractionator bottom system" cleaning and "turnaround".

**Attachment 6D - MSDS for Spent FCC Catalyst**

# Material Safety Data Sheet



## SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

### Spent FCC Catalyst (ALL)

**Company Identification**  
Chevron Products Company  
Marketing, MSDS Coordinator  
6001 Bollinger Canyon Road  
San Ramon, CA 94583  
United States of America

**Transportation Emergency Response**  
CHEMTREC: (800) 424-9300 or (800) 424-9300 or (703) 527-3887

#### Health Emergency

ChevronTexaco Emergency Information Center: Located in the USA. International collect calls accepted.  
(800) 231-0623 or (510) 231-0623

#### Product Information

MSDS Requests: (800) 689-3998

## SECTION 2: COMPOSITION INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
Kaolin (clay)	1332-58-7	20 - 80 %wt/wt
Zeolites, aluminosilicates	1318-02-1	5 - 50 %wt/wt
Aluminum oxide	1344-28-1	0 - 55 %wt/wt
Silica	7631-86-9	2 - 30 %wt/wt
Aluminum phosphate	7784-30-7	0 - 5 %wt/wt
Petroleum coke	64741-79-3	0.01 - 1 %wt/wt
Copper oxide	1317-39-1	20 - 400 ppm (weight)
Ferric iron oxide (Fe <sub>2</sub> O <sub>3</sub> )	1309-37-1	0.35 - 2 %wt/wt
Nickel oxide	1313-99-1	0.01 - 0.3 %wt/wt
Sodium oxide	1313-59-3	0.26 - 0.5 %wt/wt
Vanadium oxide	1314-34-7	0.02 - 0.3 %wt/wt
Magnesium oxide	1309-48-4	0 - 10 %wt/wt
Lead	7439-92-1	0 - 100 ppm (weight)
Quartz, silica, cristobalite	14808-60-7	0 - 1 %wt/wt
Rare earth oxides	68188-83-0	0 - 5 %wt/wt
Rhenium oxide	12036-09-8	0 - 3 %wt/wt
Titanium dioxide	13463-67-7	0 - 3 %wt/wt

## SECTION 3: HAZARDS IDENTIFICATION

### EMERGENCY OVERVIEW

- MAY CAUSE ALLERGIC SKIN AND RESPIRATORY REACTIONS

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CUSA-CSB-0082081  
EPA



- CAUSES EYE, SKIN, AND RESPIRATORY TRACT IRRITATION
- CANCER HAZARD - CAN CAUSE CANCER

#### IMMEDIATE HEALTH EFFECTS

**Eye:** Contact with the eyes causes irritation. Symptoms may include pain, tearing, reddening, swelling and impaired vision.

**Skin:** Contact with the skin causes irritation. Contact with the skin may cause an allergic skin reaction. Symptoms may include pain, itching, discoloration, swelling, and blistering. Not expected to be harmful to internal organs if absorbed through the skin.

**Ingestion:** May be irritating to mouth, throat, and stomach. Symptoms may include pain, nausea, vomiting, and diarrhea.

**Inhalation:** The dust from this material may cause an allergic respiratory reaction. Symptoms may include runny nose, sore throat, sneezing, coughing, chest tightness, and difficulty breathing. The dust from this material may cause respiratory irritation. Symptoms of respiratory irritation may include coughing and difficulty breathing.

#### DELAYED OR OTHER HEALTH EFFECTS:

**Cancer:** Prolonged or repeated exposure to this material can cause cancer. Contains nickel compounds, which have been classified as a Group 1 carcinogens (carcinogenic to humans) by the International Agency for Research on Cancer (IARC) and Reasonably Anticipated to be Carcinogenic in humans by the USA National Toxicology Program (NTP).

See Section 11 for additional information. Risk depends on duration and level of exposure.

#### SECTION 4: FIRST AID MEASURES

**Eye:** Flush eyes with water immediately while holding the eyelids open. Remove contact lenses, if worn, after initial flushing, and continue flushing for at least 15 minutes. Get medical attention if irritation persists.

**Skin:** Wash skin with water immediately and remove contaminated clothing and shoes. Get medical attention if any symptoms develop. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

**Ingestion:** If swallowed, get medical attention. Do not induce vomiting. Never give anything by mouth to an unconscious person.

**Inhalation:** Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if breathing difficulties continue. During an emergency, wear an approved, positive pressure air-supplying respirator. Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get immediate medical attention.

#### SECTION 5: FIRE FIGHTING MEASURES

##### FLAMMABLE PROPERTIES:

**Flashpoint:** Not Applicable

**Autoignition:** Not Applicable

**Flammability (Explosive) Limits (% by volume in air):** Lower: Not Applicable Upper: Not Applicable

**EXTINGUISHING MEDIA:** Use water fog, foam, dry chemical or carbon dioxide (CO<sub>2</sub>) to extinguish flames.

##### PROTECTION OF FIRE FIGHTERS:

**Fire Fighting Instructions:** This material will burn although it is not easily ignited. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus. Hydrocarbon vapors can be trapped in heavily coked or cemented catalysts. Subsequent release due to physical breakup or diffusion may create a fire hazard.



**Combustion Products:** Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion. Combustion may form oxides of: Carbon Monoxide, Metal Oxide Fumes, Carbon Dioxide

#### SECTION 6: ACCIDENTAL RELEASE MEASURES

**Protective Measures:** Eliminate all sources of ignition in vicinity of spilled material.  
**Spill Management:** Clean up spills immediately, observing precautions in Exposure Controls/Personal Protection section. Reduce airborne dust and prevent scattering by moistening with water.  
**Reporting:** Report spills to local authorities as appropriate or required.

#### SECTION 7: HANDLING AND STORAGE

**Precautionary Measures:** Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Do not breathe dust. Wash thoroughly after handling.  
**General Handling Information:** Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.  
**Static Hazard:** Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures.  
**Container Warnings:** Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

#### SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

##### GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

##### ENGINEERING CONTROLS:

Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below the recommended exposure limits. Sensitized individuals should be removed from further exposure.

##### PERSONAL PROTECTIVE EQUIPMENT

**Eye/Face Protection:** Wear protective equipment to prevent eye contact. Selection of protective equipment may include safety glasses, chemical goggles, face shields, or a combination depending on the work operations conducted.

**Skin Protection:** Wear protective clothing to prevent skin contact. Selection of protective clothing may include gloves, apron, boots, and complete facial protection depending on operations conducted.

Suggested materials for protective gloves include: Nitrile Rubber, Viton.

**Respiratory Protection:** Determine if airborne concentrations are below the recommended occupational exposure limits for jurisdiction of use. If airborne concentrations are above the acceptable limits, wear an approved respirator that provides adequate protection from this material, such as: High Efficiency Particulate Air + Organic Vapor.

Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

**Occupational Exposure Limits:**

Component	Agency	TWA	STEL	Ceiling	Notation
Aluminum oxide	ACGIH	10 mg/m3	--	--	A4
Aluminum phosphate	ACGIH	2 mg/m3	--	--	--
Ferric Iron oxide (Fe2O3)	ACGIH	5 mg/m3	--	--	--
Kaolin (clay)	ACGIH	2 mg/m3	--	--	A4
Lead	ACGIH	.05 mg/m3	--	--	A3 as Pb
Magnesium oxide	ACGIH	10 mg/m3	--	--	A4
Nickel oxide	ACGIH	.2 mg/m3	--	--	A1 as Ni
Petroleum coke	CVX	5 mg/m3	--	--	--
Quartz, silica, cristobalite	ACGIH	.05 mg/m3	--	--	A2
Silica	ACGIH	3 mg/m3	--	--	--
Titanium dioxide	ACGIH	10 mg/m3	--	--	A4

Consult local authorities for appropriate values.

**SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES**

**Attention:** the data below are typical values and do not constitute a specification.

**Color:** Grey

**Physical State:** Powder

**Odor:** Odorless

**pH:** Not Applicable

**Vapor Pressure:** Not Applicable

**Vapor Density (Air = 1):** Not Applicable

**Boiling Point:** Not Applicable

**Solubility:** Insoluble

**Melting Point:** No Data Available

**Density:** No Data Available

**SECTION 10. STABILITY AND REACTIVITY**

**Chemical Stability:** This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

**Incompatibility With Other Materials:** May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

**Hazardous Decomposition Products:** Metal Oxide Fumes (Elevated temperatures)

**Hazardous Polymerization:** Hazardous polymerization will not occur.

**SECTION 11. TOXICOLOGICAL INFORMATION**

**IMMEDIATE HEALTH EFFECTS**

**Eye Irritation:** The eye irritation hazard is based on evaluation of data for similar materials or product components.

**Skin Irritation:** The skin irritation hazard is based on evaluation of data for similar materials or product components.

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**Skin Sensitization:** The skin sensitization hazard is based on evaluation of data for similar materials or product components.

**Acute Dermal Toxicity:** The acute dermal toxicity hazard is based on evaluation of data for similar materials or product components.

**Acute Oral Toxicity:** The acute oral toxicity hazard is based on evaluation of data for similar materials or product components.

**Acute Inhalation Toxicity:** The acute inhalation toxicity hazard is based on evaluation of data for similar materials or product components.

#### **ADDITIONAL TOXICOLOGY INFORMATION:**

This material contains aluminum oxide. Aluminum oxide has not been shown to cause adverse systemic effects. Higher than normal levels of aluminum have been found in brain, muscle and bone tissues of patients with chronic renal failure and dementia who are undergoing dialysis treatment. The source of aluminum is believed to be oral aluminum hydroxide given during dialysis or tap water used in the dialysate. However, a causal link between aluminum exposure and neurological disease has not been shown.

Chronic inhalation of respirable aluminosilicate dust may result in silicosis. Similar materials (zeolites other than erionite) were classified by the International Agency for Research on Cancer (IARC) as Group 3, cannot be evaluated as to their carcinogenicity to humans.

This material contains petroleum coke. It is likely to contain polynuclear aromatic hydrocarbons (PAH's) which has been shown to cause skin cancer after prolonged and frequently repeated contact with the skin of laboratory animals. When delayed process coke dissolved in mineral oil was applied to the skin of mice three times a week for two years, there was no increase in skin tumors when compared to control animals. When rats and monkeys were exposed by inhalation to 10 or 30 mg of coke dust/cubic meter of air for two years, the rats developed inflammation and other cellular changes in the lungs. These apparent dose-related changes were characteristic of changes caused by irritant dusts. No toxic effects were observed in the monkeys. While the possibility of cancer occurring in humans following handling of this material is thought to be remote, skin contact or the breathing of dust of this material should be reduced to a minimum.

This catalyst contains inorganic nickel compounds. **GENERAL:** A limited number of case reports in the medical literature suggest that inhalation of nickel compounds may result in respiratory sensitization. **CARCINOGENICITY:** The International Agency for Research on Cancer (IARC) considers nickel and certain nickel compounds to be carcinogenic to human beings based on increased incidences of cancers of the respiratory tract of human beings and test animals. However, there is no information on the potential carcinogenicity of this catalyst in human beings. Although the catalyst pellets present little hazard from inhalation due to their large size, inhalation of the dust could be hazardous. Because of the potential carcinogenic risk associated with inorganic nickel compounds, we strongly recommend that the precautions outlined in this MSDS be followed when handling this catalyst.

This product contains crystalline silica. Repeated inhalation of the dust may cause insidious lung injury and possibly silicosis. In patients with silicosis, areas of the lung become filled with scar tissue. The signs and symptoms may include cough, shortness of breath, difficulty in breathing, and loss of weight. The disease can progressively worsen and result in death. In their Monograph - Volume 42, the International Agency for Research on Cancer (IARC) classified crystalline silica as a probable human carcinogen. Users of this product should confirm that their operating, storage, and distribution facilities comply with the OSHA Hazard Communication Standard (29CFR 1910.1200) for all materials containing more than 0.1% crystalline silica. Employee exposures to airborne crystalline silica dust should be controlled to below the OSHA 8 hour PEL for the particular type of crystalline silica present.

#### **SECTION 2. TOXICOLOGICAL INFORMATION**

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**ECOTOXICITY**

The toxicity of this material to aquatic organisms has not been evaluated. Consequently, this material should be kept out of sewage and drainage systems and all bodies of water.

**ENVIRONMENTAL FATE**

This material is not expected to be readily biodegradable. The biodegradability of this material is based on data for the components.

**SECTION 12: DISPOSAL CONSIDERATIONS**

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by international, country, or local laws and regulations.

**SECTION 13: TRANSPORT INFORMATION**

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

**DOT Shipping Description:** ALUMINA OXIDE CATALYST - NOT REGULATED AS A HAZARDOUS MATERIAL FOR TRANSPORTATION UNDER 49 CFR

**IMO/IMDG Shipping Description:** NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORTATION UNDER THE IMDG CODE

**ICAO/IATA Shipping Description:** NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORTATION UNDER ICAO

**SECTION 15: REGULATORY INFORMATION****REGULATORY LISTS SEARCHED:**

01-1=IARC Group 1  
01-2A=IARC Group 2A  
01-2B=IARC Group 2B

The following components of this material are found on the regulatory lists indicated.

Lead	01-2A, 01-2B
Nickel oxide	01-1
Quartz, silica, cristobalite	01-1

**CHEMICAL INVENTORIES:**

All components comply with the following chemical inventory requirements: ENCS (Japan), KECI (Korea), TSCA (United States).

One or more components is listed on ELINCS (European Union). Secondary notification by the importer may be required.

One or more components does not comply with the following chemical inventory requirements: AICS (Australia), DSL (Canada), IECSC (China), PICCS (Philippines).

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R36/37/38: Irritating to eyes, respiratory system and skin.  
 R42/43: May cause sensitization by inhalation and skin contact.  
 R45: May cause cancer.  
 R53: May cause long-term adverse effects in the aquatic environment.  
 S22: Do not breathe dust.  
 S24/25: Avoid contact with skin and eyes.  
 S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.  
 S36/37/39: Wear suitable protective clothing, gloves and eye/face protection.  
 S53: Avoid exposure - obtain special instructions before use.  
 S61: Avoid release to the environment. Refer to special instructions/Safety data sheets.

#### WHMIS CLASSIFICATION:

Class D, Division 2, Subdivision A: Very Toxic Material -  
 Carcinogenicity  
 Respiratory Tract Sensitization  
 Class D, Division 2, Subdivision B: Toxic Material -  
 Skin or Eye Irritation  
 Skin Sensitization

#### SECTION 15 OTHER INFORMATION

**REVISION STATEMENT:** This is a new Material Safety Data Sheet.  
**Revision Date** 05/13/2005

#### ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	PEL - Permissible Exposure Limit
	CAS - Chemical Abstract Service Number
ACGIH - American Conference of Government Industrial Hygienists	IMO/IMDG - International Maritime Dangerous Goods Code
API - American Petroleum Institute	MSDS - Material Safety Data Sheet
CVX - ChevronTexaco	NFPA - National Fire Protection Association (USA)
DOT - Department of Transportation (USA)	NTP - National Toxicology Program (USA)
IARC - International Agency for Research on Cancer	OSHA - Occupational Safety and Health Administration

Prepared according to the International Standard (ISO 11014-1) by the ChevronTexaco Energy Technology Company, 100 Chevron Way, Richmond, California 94802.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

6. Process Safety Information (PSI) and Process Safety Hazards (PHA) for FCC "fractionator bottom system" cleaning and "turnaround".

**PHA Information:**

**Attachment 6E - 2008 FCC PHA Revalidation Node 20, Fractionator Bottoms**

# Worksheets

Section: 20. C-90 Fractionator bottoms through V-105A-D, P-105A/B Fractionator; bottoms pump around pumps, V-102A/B & V-108A/B Fractionator Bottoms Strainers, E-102A/B/D/E, E-108 Fractionator Bottoms Reflux coolers, back to C-90

Section Design Conditions-Parameters: C-90 Fractionator bottoms pump around, remove heat from Fractionator bottoms  
Drawings: D-320282; D-320284; D-320315; D-320825; D-335138; D-346235; D-346236

Deviation	Causes	Consequences	S Cat	Safeguards	S	L	RR	Recommendations
1. No Flow	1. P-105A/B Fractionator bottoms pump around pumps off.	1. Temperature increases in C-90 Fractionator bottoms. Temperature profile increases throughout C-90. Due to loss of P-105's there will be a back up of HCO in the column. Loss of flow to P-114's. Heavier components are driven up column, off spec column products. Increased level in C-90 blocking reaction mix line inlet leading to equipment damage. Potential increased pressure in reactor with possible release to atm. May result in fire and/or personnel injury.	S	1. Pumps have APS with alarm. 2. Global Operator training and SOPs 3. PIS: Process Interlock System pulls feed at 90% level on C-90 4. C90 LC-090 level indication, control and alarm	3	5		
	2. C-90 Fractionator bottoms quench line (P2098-6") plugged or FC-91 fails closed.	1. Increased temperature in C-90 bottoms may result in pump damage. Operational upset. May drive heavier components up C-90 Fractionator, off spec products.	A	1. Bypass available 2. C90 FC-091 flow indication and alarm 3. C90 52-TI-910 temperature indication and alarm	5	3		
	3. FV-028 (C-90 Fractionator bottoms recycle to V-80 Reactor) closed.	1. Loss of C-90 Fractionator bottoms recycle to V-80 Reactor. Loss of coke make in V-70 regenerator. Minor operational upset.	A	1. Global Operator training and SOPs	6	4		
	4. Loss of cooling	1. Loss of cooling of pump	S	1. Lube oil temperature alarms	5	4		



Section: 20. C-80 Fractionator bottoms through V-105A-D, P-105A/B Fractionator bottoms pump around, remove heat from Fractionator bottoms  
Bottoms Reflux coolers, back to C-80

Section Design Conditions-Parameters: C-80 Fractionator bottoms pump around, remove heat from Fractionator bottoms  
Drawings: D-320282; D-320284; D-320315; D-320825; D-346233; D-346235

Deviation	Causes	Consequences	S Cat	Safeguards	S	L	RR	Recommendations
	water to P-105A/B Fractionator bottoms pumps lube oil coolers.	bearing housing to P-105/A. May lead to pump damage. Potential fire. Potential personnel injury.						
	5. FC-105 fails closed.	Loss of cooling resulting in increased temperatures in C-90 bottoms leading to coking.	A	1. C90 52-TI-910 temperature indication and alarm. 2. Flow indication and alarms on Bottoms loop 3. Valve is fail open, transmitter is vortex shedding reducing the likelihood of plugging of leads	4	3	6	
		Potential seal failure on bottoms pumps resulting in possible fire and personnel injury.	S	1. Pumps have overamp S/D 2. Flow indication and alarms on Bottoms loop 3. Pumps are variable speed	4	3	6	
	6. TV-051/A/B fails closed	Used to maintain heat on pump case when not in use. Loss of heat source to pump out of service may result in pump damage when placed in service (thermal shock).	A	1. Global Operator training and SOPs	5	4	5	
2. More Flow	1. FV-028 (C-90 Fractionator bottoms recycle to V-80 Reactor) wide open.	1. Increased C-90 Fractionator bottoms recycle to V-80 Reactor. Increased coke make in V-70 Regenerator. Increased temperature in V-70. Possible equipment damage due to increase of temperature in V-70 Regenerator. Possible environmental	E	1. Global Operator training and SOPs	6	4	5	



Section: 20. C-90 Fractionator bottoms through V-105A-D, P-105A/B Fractionator bottoms pump around pumps, V-102A/B & V-108A/B Fractionator Bottoms Strainers, E-102A/B/D/E, E-108 Fractionator Bottoms Reflux coolers, back to C-90

Section Design Conditions-Parameters: C-90 Fractionator bottoms pump around, remove heat from Fractionator bottoms  
Drawings: D-320282; D-320284; D-320315; D-320825; D-346233; D-346235

Deviation	Causes	Consequences	S Cat	Safeguards	S	L	RR	Recommendations
	2. SC-105B & SK105A wide open.	Violation due to exceeding CO limit. Increased bottoms reflux to C-90 leading to increased cooling and increased bottoms levels may result in covering reaction mix line. Potential increase in pressure in reactor possibly leading to release to atm. May result in fire and/or personnel injury.	S	1. C90 FC-105 flow control 2. Pumps have overamp S/D 3. C90 LC-090 level indication, control and alarm 4. PIS: Process Interlock System pulls feed at 90% level on C-90	3	4	6	
	3. P-105/A Fractionator bottoms pump around pumps all three on.	Increased bottoms reflux to C-90 leading to increased cooling and increased bottoms levels may result in covering reaction mix line. Potential increase in pressure in reactor possibly leading to release to atm. May result in fire and/or personnel injury.	S	1. C90 FC-105 flow control 2. C90 LC-090 level indication, control and alarm 3. PIS: Process Interlock System pulls feed at 90% level on C-90	3	4	6	
	4. FC-105 fails open.	No new consequences.						
	5. FC-091 fails open.	Decreased temperatures in Fractionator bottoms may lead to higher level in C90. No new consequences.						
3. Less Flow	1. AOVs for V-105s closed (assuming only one closes, otherwise considered	Increased temperatures in Fractionator bottoms. May reduce velocity in exchangers which may lead to increased fouling. Temporary pump cavitation. (Damage is not	A	1. Global Operator rounds	6	4	3	

Section: 20. C-90 Fractionator bottoms through V-105A-D, P-105A/B Fractionator bottoms pump around pumps, V-102A/B & V-108A/B Fractionator Bottoms Strainers, E-102A/B/D/E, E-106 Fractionator Bottoms Reflux coolers, back to C-90

Section Design Conditions-Parameters: C-90 Fractionator bottoms pump around, remove heat from Fractionator bottoms  
Drawings: D-320282; D-320284; D-320315; D-320825; D-333138; D-346233; D-346235

Deviation	Causes	Consequences	S Cat	Safeguards	S	L	RR	Recommendations
	double jeopardy)	expected.)						
	2. V-105A-D Fractionator bottoms strainers plugged.	No new consequences.						
	3. EBVs located in suction and discharge of P-105A/B Fractionator bottoms pump around pumps closed.	1. If suction or discharge valves are closed: Loss of suction to P-105A/B. Temperature increases in C-90 Fractionator bottoms. Heavier components are driven up column, off spec column products. Contaminate MCO with HCO and drive MCO overhead. Major column upset. MCO to gas recovery unit columns result in column upsets. May also lose level in the bottoms of C-90. Possible pump damage. Seal Failure. Hydrocarbon release and fire. Potential personnel injury.	S	1. Pumps have automatic S/D if EBV is closed 2. P105A/B Discharge pressure alarms on all pumps PI-05A/B 3. EBVs have fusible links 4. C90 FC-105 flow control and alarm 5. Pumps have overamp S/D 6. C90 FC-091 flow indication and alarm 7. C90 52-TI-910 temperature indication and alarm 8. Pumps are spared with automatic start up on discharge.	3	5		
	4. Loss of one of the P105 pumps	No new consequences.						
	5. AOVs at V-102A/B & V-106A/B Fractionator bottoms strainers closed.	1. Partial loss of Bottoms reflux to C-90. Temperature increases in C-90 Fractionator bottoms. Heavier components are driven up column, off spec column products.	A	1. C90 52-TI-910 temperature indication and alarm 2. V102/6 high dP alarms	5	4		

Section: 20. C-90 Fractionator bottoms through V-105A-D, P-105A/B Fractionator bottoms pump around pumps, V-102A/B & V-106A/B Fractionator Bottoms Strainers, E-102A/B/D/E, E-106 Fractionator Bottoms Reflux coolers, back to C-90

Section Design Conditions-Parameters: C-90 Fractionator bottoms pump around, remove heat from Fractionator bottoms Drawings: D-320282; D-320284; D-320315; D-320825; D-333138; D-346233; D-346235

Deviation	Causes	Consequences	S Cat	Safeguards	S	L	RR	Recommendations
6. E-102A/B/D/E Fractionator bottoms reflux cooler fouled.		Contaminate MCO with HCO and drive MCO overhead. Major column upset. MCO to gas recovery unit columns result in column upsets. May also lose level in the bottoms of C-90.	A		5	3		
4. Reverse Flow	1. Check valve on P-105 stuck open	1. Restricts C-90 Fractionator bottoms pump around flow. Reduces heat removal from C-90 bottoms. Reduces 150# steam generation. Operational upset.	A		5	3		
5. Mis-Directed Flow	1. Flush oil left open to piping during normal operation. 2. Hydrocarbon blowdown from any bottoms system equipment left open.	1. Potential mis-operation of pumps during pump switch leading to loss of flow which may result in loss of heat removal and column upset. 1. Loss of flush oil (LCO) to HCO product. Economic penalty.	A		5	3		
6. More	1. TC-105 fails	1. Hydrocarbon to relief system. Overwhelming V-730 relief knockout drum potentially leading to inability to go to relief. No new consequences.	A		4	4		

Section: 20. C-90 Fractionator bottoms through V-105A-D, P-105A/B Fractionator bottoms pump around pumps, V-102A/B & V-108A/B Fractionator Bottoms Strainers, E-102A/B/D/E, E-106 Fractionator Bottoms Reflux coolers, back to C-90

Section Design Conditions-Parameters: C-90 Fractionator bottoms pump around, remove heat from Fractionator bottoms Drawings: D-320282; D-320284; D-320315; D-320825; D-333138; D-346233; D-346235

Deviation	Causes	Consequences	S Cat	Safeguards	S	L	RR	Recommendations
Temperature	open.							
7. Less Temperature	1. No new causes discovered.							
8. More Pressure	1. No new causes discovered.							
9. Less Pressure	1. No new causes discovered.							
10. More Level	1. No new causes discovered.							
11. Less Level	1. No new causes discovered.							
12. Contamination	1. No new causes discovered.							
13. Startup/Shutdown	1. C-90 Fractionator bottoms outlet plugged due to coke formation or catalyst carryover from V-80 Reactor (catalyst plugging most likely to occur during start-up).	1. Simultaneous loss of flow to P-105s Fractionator bottoms pump around and C-90 level control. Total loss of heat removal from C-90 bottoms. Requires unit shutdown to remove coke and catalyst. Economic penalty. Possible pump damage. Seal failure. Hydrocarbon release and fire. Potential personnel injury.	S	1. Extra personnel on hand 2. Global Operator training and SOP's 3. V80 50-FB-080 riser velocity calculation 4. V80 50-PD-081 cyclone delta P monitoring (engineers) 5. Global Catalyst monitoring and sampling of Bottoms stream 6. New bottoms project (2005) spared equipment, sized for full feed rate and designed to accommodate plugging 7. C90 FC-105 flow control and alarm	3	4	6	

Section: 20. C-90 Fractionator bottoms through V-105A-D, P-105A/B Fractionator bottoms pump around pumps, V-102A/B & V-108A/B Fractionator Bottoms Strainers, E-102A/B/D/E, E-106 Fractionator Bottoms Reflux coolers, back to C-90

Section Design Conditions-Parameters: C-90 Fractionator bottoms pump around, remove heat from Fractionator bottoms  
Drawings: D-320282; D-320284; D-320315; D-320825; D-333138; D-346233; D-346235

Deviation	Causes	Consequences	S Cat	Safeguards	S	L	RR	Recommendations
				8. Minimum flow on HCO outlet stream to purge system of catalyst carryover 9. P105s shutdown on high amps 10. Remote-operated isolation valves on suction and discharge of P105s 11. P105s deluge system				
		1. Simultaneous loss of flow to P-105s Fractionator bottoms pump around and C-90 level control. Total loss of heat removal from C-90 bottoms. Requires unit shutdown to remove coke and catalyst. Economic penalty.	A	1. Extra personnel on hand 2. Global Operator training and SOPs 3. V80 50-FB-080 riser velocity calculation 4. V80 50-PD-081 cyclone delta P monitoring (engineers) 5. Global Catalyst monitoring and sampling of Bottoms stream 6. New bottoms project (2005) spared equipment, sized for full feed rate and designed to accommodate plugging 7. C90 FC-105 flow control and alarm 8. Minimum flow on HCO outlet stream to purge system of catalyst carryover 9. P105s shutdown on high amps 10. Remote-operated isolation valves on suction and	3	4	6	

Section: 20. C-90 Fractionator bottoms through V-105A-D, P-105A/B Fractionator bottoms pump around pumps, V-102A/B & V-108A/B Fractionator Bottoms Strainers, E-102A/B/D/E, E-108 Fractionator Bottoms Reflux coolers, back to C-90

Section Design Conditions-Parameters: C-90 Fractionator bottoms pump around, remove heat from Fractionator bottoms Drawings: D-320282; D-320284; D-320315; D-320825; D-333136; D-346233; D-346235

Deviation	Causes	Consequences	S Cat	Safeguards	S	L	RR	Recommendations
				discharge of P105s				
				11. P105s deluge system				
14. Leak/Rupture	1. No new causes discovered.							
15. Human Factors	1. No new causes discovered.							
16. Miscellaneous-Instrumentation	1. No new causes discovered.							

6. Process Safety Information (PSI) and Process Safety Hazards (PHA) for FCC "fractionator bottom system" cleaning and "turnaround".

PHA Information:

Attachment 6F – Chevron Integrated Risk Prioritization Matrix – This document explains the risk prioritization system used in Attachment 6E.

